AP Computer Science
APLine Project

Name ______________________________

Date _____________ Period __________

APLine Project

The AP Computer Science test that you will take this spring will have four Free Response questions (in addition to 40 multiple choice questions). Every year after the test has been taken the College Board publishes the four Free Response questions. *The following is an actual Free Response question from the 2010 AP Computer Science test*. If this were an actual AP test, you would be writing your responses on paper, but I am giving it to you now as a project to program on your computer.

You know everything you need to know in order to complete this project. Your task is to (using BlueJ) create the `APLine` class that you will write from scratch as specified below. To get started, first download, extract, and save the APLine project to your computer. The download link is located on the assignment web page for this project. Once you have saved the files to your computer, then click on the BlueJ package icon in the project directory, and BlueJ will open up the project for you. You can see that there is a tester class (called `APLineTest`) that you can run anytime you want and it will show you the status of your work so far.

If you are not sure how to proceed, have a look at the `APCircle` class we did together in class a few days ago. The `APLine` class will follow much of the same protocols.

Good luck. Show me the results of your successful test when you are finished. Feel free to see me if you have any questions or difficulties in the meantime.

Ready to get started? On the other side of this sheet is Free Response question #2 from the 2010 AP Computer Science test:

An `APLine` is a line defined by the equation $ax + by + c = 0$, where a is not equal to zero, b is not equal to zero, and a, b, and c are all integers. The slope of an `APLine` is defined to be the `double` value $-a / b$. A point (represented by integers x and y) is on an `APLine` if the equation of the `APLine` is satisfied when those x and y values are substituted into the equation. That is, a point represented by x and y is on the line if $ax + by + c$ is equal to 0. Examples of two `APLine` equations are shown in the following table.

Equation	**Slope (–*a* / *b*)**	**Is point (5, -2) on the line?**
$5x + 4y - 17 = 0$	-5 / 4 = -1.25	Yes, because 5(5) + 4(-2) + (-17) = 0
$-25x + 40y + 30 = 0$	25 / 40 = 0.625	No, because -25(5) + 40(-2) + 30 ≠ 0

Assume that the following code segment appears in a class other than `APLine`. The code segment shows an example of using the `APLine` class to represent the two equations shown in the table.

```
APLine line1 = new APLine(5, 4, -17);
double slope1 = line1.getSlope(); // slope1 is assigned -1.25
boolean onLine1 = line1.isOnLine(5, -2); // true because 5(5) + 4(-2) + (-17) = 0

APLine line2 = new APLine(-25, 40, 30);
double slope2 = line2.getSlope(); // slope2 is assigned 0.625
boolean onLine2 = line2.isOnLine(5, -2); // false because -25(5) + 40(-2) + 30 ≠ 0
```

Write the `APLine` class. Your implementation must include a constructor that has three integer parameters that represent a, b, and c, in that order. You may assume that the values of the parameters representing a and b are not zero. It must also include a method `getSlope` that calculates and returns the slope of the line, and a method `isOnLine` that returns `true` if the point represented by its two parameters (`x` and `y`, in that order) is on the `APLine` and returns `false` otherwise. Your class must produce the indicated results when invoked by the code segment given above. You may ignore any issues related to integer overflow.